at the $\lambda/2$ point in a cavity one wave-length long. Figure 2 shows the standing wave ratio looking into this cavity *vs.* the static field H. The frequency at maximum absorption was 23730 megacycles. The g value 2.16 for the sphere as calculated from the sphere equation $\omega_0=\gamma H$ is fairly consistent with the g value 2.12 for the plane specimen calculated from the plane equation $\omega_0=\gamma(BH)^{\frac{1}{2}}$. These equations were derived by Kittel.[2] The measurements on the sphere may therefore be considered as an approximate confirmation of the theory.

Sincere thanks are due Dr. C. Kittel and Mr. W. A. Yager for valuable suggestions and discussion, and to Mr. F. J. Schnettler who supplied the ferrite samples.

[1] W. A. Yager and R. M. Bozorth, Phys. Rev. **72**, 80 (1947).
[2] C. Kittel, Phys. Rev. **73**, 155 (1948).

Note on Zero-Zero Transitions*

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March 19, 1948

ZERO-ZERO nuclear transitions have been suggested by Sachs[1] as an explanation of long lived isomers. He computed the energy spectra and transition probabilities for two-electron and two-quantum emissions. Stimulated by preliminary results of experiments by Goldhaber, Muehlhause, and Turkel[2] on the isomeric transition in Ir^{192} (mean life 2.16 min., energy 58 kev), which shows a continuous γ-ray spectrum in addition to conversion electrons, we have computed the γ-ray energy spectrum and lifetimes for zero-zero transitions in which one electron and one quantum are emitted. For comparison, the lifetime for the transition *og*→*og* (or *ou*→*ou*) is computed by direct emission of an electron. The analogous transition in the case *og*→*ou* is strictly forbidden.

The calculation is straightforward, and most of the necessary matrix elements are given by Sachs.[1] We consider the transition *og*→*og* and *og*→*ou* with a *single* intermediate state of total angular momentum one and parity either the same or different from the ground state. The energy of the intermediate state above the ground state is taken to be either very much less than E or very much greater than ($\sim$20 times) E where E is the total energy available for the transition, namely, 58 kev. It is to be noted that this energy is insufficient to remove a K electron in Ir and, consequently, we have only L conversion.[2]

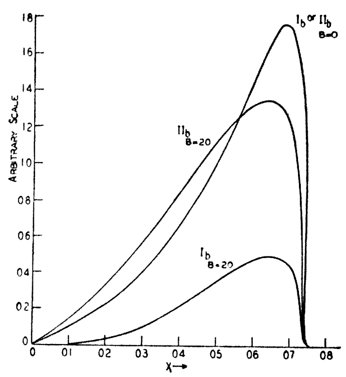

FIG. 1. Gamma-ray energy spectra; $\mathrm{I}_b \cdots o_g\rightarrow 1_g\rightarrow o_g$; $\mathrm{II}_b \cdots o_u\rightarrow o1_u\rightarrow o_g$.

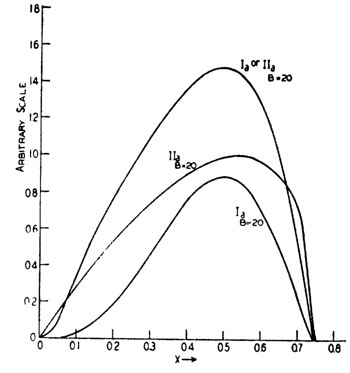

FIG. 2. Gamma-ray energy spectra; $\mathrm{I}_a \cdots o_g\rightarrow 1_u\rightarrow o_g$; $\mathrm{II}_a \cdots o_u\rightarrow 1_g\rightarrow o_g$.

It should be emphasized that the absolute values of the lifetimes are to be regarded as merely order of magnitude estimates. The shapes of the γ-ray spectra, on the other hand, should be fairly reliable. From Figs. 1 and 2, we see that one may have a rather peaked distribution which might be confused with a sharp line.

In Table I the lifetimes calculated for the various cases are summarized. The notation and numerical data are as follows: E is the energy of the transition, I is the ionization potential in units of E, x is the γ-ray energy in units of E, β is the energy of the intermediate state above the initial state in units of E, and τ is the mean life. For our lifetime estimates we take $E=58$ kev, and $I=0.25$. (A transition from an initial state with zero angular momentum and even parity to an intermediate state of angular momentum one and odd parity and then a transition from the intermediate to the final state of zero angular momentum and even parity is symbolized by *og*→1*u*→*og*, etc.

TABLE I.

	Transition	β	(sec.)
I*a*	*og*→1*u*→*og*	$\sim$0	5.4×10^{-2}
		$\sim$20	1.18×10^{-2}
I*b*	*og*→1*g*→*og*	0	2.40×10^{2}
		20	7.45×10^{6}
II*a*	*ou*→1*g*→*og*	0	3.22×10^{-3}
II*b*	*ou*→1*u*→*og*	20	8.70×10^{-3}
	og→*og*	—	4.26×10^{-8}

The experimental evidence at the present time is insufficient to draw any definite conclusions in the case of Ir.

This work is the result of interesting discussions of the Ir problem with Professors M. Goldhaber and R. G. Sachs.

* This work has been carried out under the auspieces of the Atomic Energy Commission. It was completed and submitted for declassification on August 1, 1947.
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[1] R. G. Sachs, Phys. Rev. **57**, 194 (1940).
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